

GRUNDFOS INSTRUCTIONS

Grundfos MixiMizer™

Installation and Operation



Pumps Incorporating the (MR) Mixing Reset Control with Date Code 0718 or higher



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MixiMizer™

The hot water heating system can now be accurately and comfortably controlled by modulating the hot water supply. As the outdoor temperature changes, the MixiMizer will automatically calculate the pump speed required, to ensure proper water temperature for your heating system.

For maximum performance and proper installation, please follow the simple instructions in this manual.

1. Shipment Inspection

Check the contents of this package. Care should be taken to ensure the pump is NOT dropped or mishandled; **dropping will damage the pump.**

Grundfos MixiMizer Injection Pump Package Includes:

- One Grundfos UP15-42 MixiMizer pump with integral control.
- Two Water Temperature Sensors (Supply & Return) – Pre-wired into control box with 8' of wire.
- One 6' line cord with 115 V plug, pre-wired into control box.
- One Outdoor Air Temperature Sensor (OATS)
- Two flange gaskets
- Installation and Operating Instructions.
- Four sensor (Supply & Return) cable ties.

When installing and using this electrical equipment, basic safety precautions and local code requirements should always be followed, including the following:



CAUTION: The installer must ensure that this control and its wiring are isolated and/or shielded from strong sources of electromagnetic noise. Conversely, this Class B digital apparatus complies with

Part 15 of the FCC Rules and meets all requirements of the Canadian Interference-Causing Equipment Regulations. However, if this control does cause harmful interference to radio or television reception, which can be determined by turning the control off and on, the user is encouraged to try to correct the interference by reorienting or relocating the receiving antenna, relocating the receiver with respect to this control, and/or connecting the control to a different circuit from that to which the receiver is connected.

CAUTION: The non-metallic Outdoor Air Temperature Sensor (OATS) and Pump Control Box enclosures do not provide grounding between conduit connections. Use grounding type bushings and jumper wires.

CAUTION: Improper installation and operation of this control could result in damage to the equipment and possibly even personal injury. It is your responsibility to ensure that this control is safely installed according to all applicable codes and standards. This electronic control is not intended for use as a primary limit control. Other controls that are intended and certified as safety limits must be placed into the control circuit.

WARNING: All field wiring to be low voltage. Power for control is provided through the power cord supplying power to the pump. Use copper conductors only. Disconnect all power sources prior to servicing.

Risk of electric shock: This pump is supplied with a grounding conductor and grounding-type attachment plug. To reduce the risk of electric shock, be certain that it is connected only to a properly grounded, grounding type receptacle.

2. General MixiMizer Features

- All minimum and maximum settings are operating, not safety limits. **Necessary auxiliary equipment and safety devices must be added.**
- The boiler return minimum temperature is fixed at 135°F. This function can be disabled by a DIP switch.
- The system supply maximum temperature is fixed at 140°F. This function can be disabled by a DIP switch.
- Heating curve parallel shift: The heating curve can be shifted 5°F parallel to the default curve. This function can be enabled by the DIP switch.
- Pump Exercising: After every three days of no operation, the control will exercise the pump for 10 seconds. The % of Pump Performance LED will be on during exercising.
- Post Purge: A 20 second post purge is available once the heat demand is removed or control enters WWSD. The purging holds the last speed used.
- As variable speed output modulates, the control flashes the % of Pump Performance LED on for ¼ second and off for ¼ to 2 1/2 seconds.
- A 2 second delay from demand to actually starting the pump is used to prevent issues with a noisy demand relay signal.
- **Optional Boiler On/Off Output:** is activated when the pump speed is raised to the boiler enable percentage (30% pump speed) and is deactivated when the pump speed falls to 50% of the boiler enable percentage (15% pump speed). The boiler enable relay has a minimum activation time of 3 minutes and a minimum de-activation time of 20 seconds.

- **Optional Zone Control Input:** The unit can accept external “Call For Heat” input signal. This must be a powered signal (20 to 30 V AC .1 VA). This function can be enabled by a DIP switch.
- **Warm Weather Shut Down (WWSD):** When the outdoor air temperature is warmer than 70°F (with $\pm 1^\circ\text{F}$ hysteresis), the unit shuts down until the temperature drops below 70°F.

Summer Service Instructions

When the outdoor temperature is greater than 70°F and the warm weather shutdown (WWSD) feature is active, the pump will normally not be in operation. To allow the pump to be tested, disconnect one of the wires from the air temperature sensor in the control box. This will simulate an open circuit in the outdoor sensor and the control assumes an outdoor temperature of 30°F. This will allow the pump to operate for testing and/or service. Remember to re-connect the outdoor temperature sensor wire when finished.

3. Pump Installation



Warning: Consult piping manufactures for material selection before installing this pump. Absence of pumping fluid may damage some piping materials.

Caution: Thoroughly clean and flush the system prior to pump installation

Pump: For Indoor Use Only

Variable speed injection systems require complete isolation between the boiler loop and system loop. For example, when the injection pump is turned off, there must be no heat transfer from the boiler loop to the system loop. In order to avoid this unwanted heat transfer, review standard primary-secondary piping techniques described below. See figure 1.

Note 1: The injection piping (Supply and Return) must be at least one pipe diameter smaller than the piping of the boiler and system loops.

Note 2: There must be a **maximum** of 4 pipe diameters between the tees in the boiler and system loops in order to prevent ghosts flow when the variable speed injection pump is off and either the boiler pump or system pump is on.

Note 3: There must be **at least** 6 pipe diameters of straight pipe on either side of the tees in order to prevent momentum of water in the boiler and system loops from pushing flow through the injection loop.

Note 4: To prevent convective heat transfer through the injection loop, there should be a minimum of 1 foot drop to create a thermal trap.

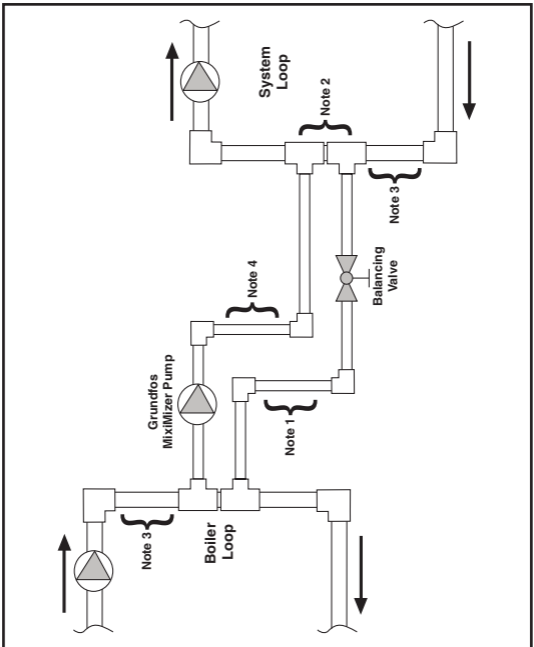


Figure 1 - Injection loop without thermal trap.

Table 1

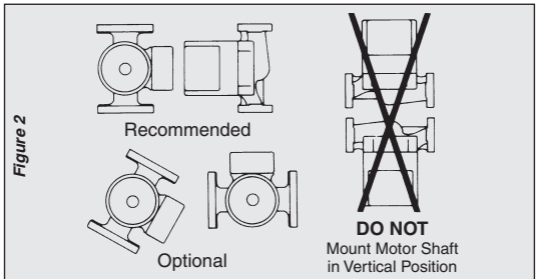
Design Injection Flow Rate (GPM)	Nominal Injection Pipe Diameter	MixiMizer Pump Model
0-5	1/2"	UP15-42BUC5/MR* UP15-42FC/MR*
0-8	3/4"	UP15-42BUC5/MR UP15-42FC/MR UP15-42BUC7/MR*
0-16	1"	UP15-42BUC7/MR



Warning: *Can produce flow velocity greater than 8 ft/sec in this size.

Arrows on the side or bottom of the pump chamber indicate direction of flow through the pump. Grundfos Miximizer pumps can be installed in both vertical and horizontal lines. Flow direction should be from the boiler loop into the system loop.

The pump must be installed with the motor shaft positioned horizontally. Under no circumstances should the pump be installed with the shaft vertical or where the shaft falls below the horizontal plane (Fig.2).



Preferred installation of the pump will have the terminal box located to one side of the pump or the other, with the conduit entry down.

If the terminal box position needs to be changed, ensure that the electrical supply is turned off and close the isolation valves before removing the Allen screws.

To change control box position:

- Remove the four (4) Allen screws (4 or 5mm wrench) while supporting the stator (motor).
- Carefully separate the stator from the pump chamber and rotate it to the correct terminal box orientation.
- Replace the Allen screws and tighten diagonally and evenly (7 ft. –lb. torque).
- Check that the motor shaft turns freely. Remove the large screw in the middle of the nameplate, insert a small flat blade screwdriver into the end of the shaft, and turn gently.
- If the shaft does not turn easily, repeat the disassembly/reassembly process.

4. Sensor Installation



Warning: All electrical work should be performed by a qualified electrician in accordance with the latest edition of the National Electrical Code, local codes and regulations.

CAUTION: Power must not be applied to any of the wires during the rough-in wiring stage.

CAUTION: All field wiring must pass through a suitable listed conduit fitting, to ensure proper strain relief.

CAUTION: All field installed wiring should meet or exceed requirements for class 2 wiring per article 725 of the National Electrical Code rated at 30VAC 250VA. Ensure that enough wiring is in the control box to reach the terminal strip.

NOTE: All field wiring shall have insulation stripped exposing 6.0mm of conductor before placement into control box terminal strip.

Outdoor Air Temperature Sensor (OATS):

The Outdoor Air Temperature Sensor includes a built in 10 kW (ohm) thermistor which provides an accurate measurement of the outdoor temperature. The OATS sensor is protected by a white U.V. resistant PVC plastic enclosure (Fig. 3A & 3B).



Figure 3A - Closed Outdoor Air Temperature Sensor (OATS)

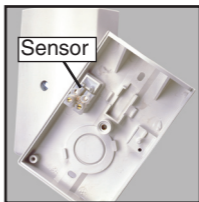


Figure 3B - Open Outdoor Air Temperature Sensor (OATS)

- Remove the screw and pull the front cover off the sensor enclosure.
- The OATS can either be mounted directly onto a wall or in a 2" x 4" electrical box. When the OATS is wall mounted, the wiring should enter through the back or bottom of the enclosure. **Do not mount the OATS with the conduit knockout facing upwards as rain could enter the enclosure and damage the sensor (Fig. 4).**
- In order to prevent heat transmitted through the wall from affecting the sensor reading, it may be necessary to install an insulating barrier behind the OATS enclosure.
- The OATS should be mounted on a wall which best represents the heat load on the building (a northern wall for most buildings or a southern facing wall for buildings with large south facing glass areas). The OATS should not be exposed to heat sources such as ventilation or window openings.

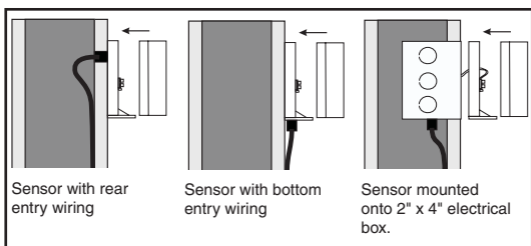


Figure 4 - Mounting the Outdoor Air Temperature Sensor (OATS)

- The OATS should be installed at an elevation above the ground that will prevent accidental damage or tampering.
- Install field wiring from the OATS mounting location to the control box for the control wiring. Do not run field wires parallel to telephone or power cables. If the sensor wires are located in an area with strong sources of electromagnetic interference (EMI), shielded cable or twisted pair should be used. If using shielded cable, the shield wire should be connected to the Com (-) terminal on the control and not to earth ground.
- Connect the two field wires from the OATS directly to the control box “Com (-)” and “Os/V” (not polar sensitive) terminals (Fig. 8).

Water Temperature Sensors (Supply & Return):

The Water Temperature Sensor has a zinc sleeve for fast response and a wide operating range (Fig 5). Factory Pre-wired

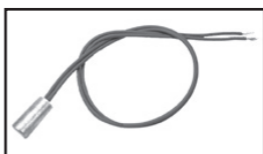


Figure 5 - Sensor

Note: Sensors are designed to mount on a pipe or in a temperature immersion well.

- The sensor can be strapped directly to the pipe using the cable tie provided. Insulation should be placed around the sensor to reduce the effect of air currents on the sensor measurement (Fig. 6).

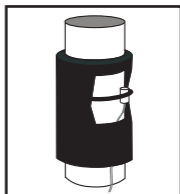


Figure 6 - Mounted Sensor

- The sensor should be placed downstream of a pump or after an elbow or similar fitting. This is especially important if large diameter pipes are used as the thermal stratification within the pipe can result in erroneous sensor readings. Proper sensor location requires that the fluid is thoroughly mixed within the pipe before it reaches the sensor.
- Locate the labels attached to each sensor. One sensor will be identified as the Return Sensor and one will be identified as the Supply Sensor. (Fig. 7A & 7B) Mount the Return Sensor to the return piping of the boiler loop. Mount the Supply Sensor to supply piping of the system loop.

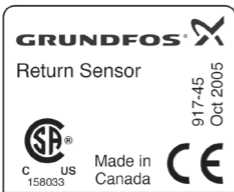


Figure 7A - Return Sensor Label



Figure 7B - Supply Sensor Label

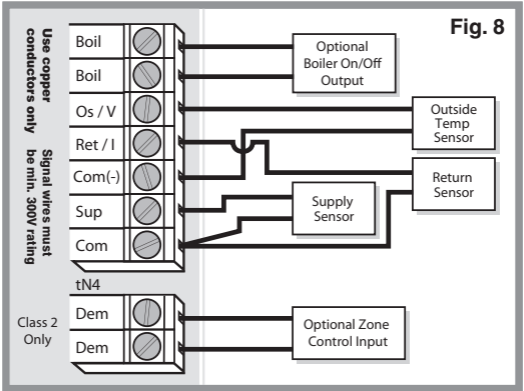
Optional Boiler On/Off Output:

The boiler terminals are used to activate a boiler when the pump is ramped to the boiler enable percentage 30% and is shut off when the pump is ramped to 50% of the boiler enable percentage. The boiler enable includes a minimum "ON" time of 3 minutes and a minimum "OFF" time of 20 seconds. Connect field wiring to control box terminals Boil & Boil (not polar sensitive) (Fig. 8).

Optional Zone Control Input:

Connect field wiring 24 V (ac) power supply or heat demand to control box terminals "DEM" and "DEM" (not polar sensitive) (Fig. 8).

Fig. 8



5. Settings

Dip switch settings:



Figure 9 - Dip Switches

SWITCH	POSITION		
	ON	OFF	DEFAULT
A	Permanent Demand	External Demand	ON position Permanent Demand
B	Max system supply set at 140°F	Max system supply feature is off	ON position Max supply set at 140°F
C	Boiler return minimum set	Boiler return minimum feature at 135°F	ON position Boiler minimum set at 135°F
D	Starting Temp. 70°F	Starting Temp. 75°F	On position No shift

Heating Curve - Dial Set Point:

Before adjusting the dial settings, read through the sequence of operation to ensure that you understand how this control operates.

The Heating Curve setting determines the number of degrees the supply water temperature is raised for each one degree drop in outdoor temperature. The Heating Curve dial position can be calculated from the following formula.

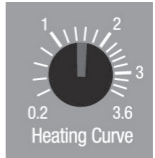


Figure 10 - Heating Curve Dial

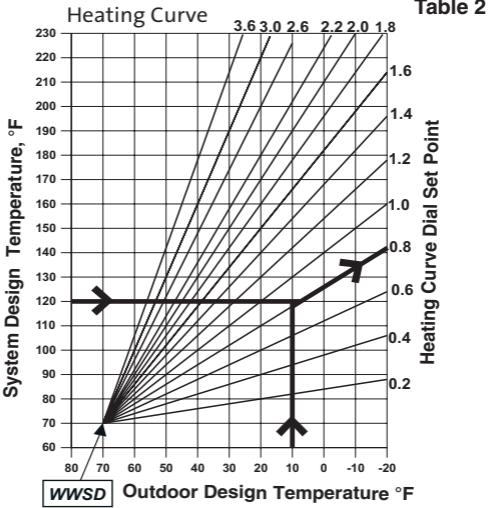
Heating Curve - Dial Set Point Example:

System Design Temperature = 120°F

Outdoor Design Temperature = 10°F

Warm Weather Shutdown (WWSD) = 70°F

$$\text{Dial Set Point} = \frac{120 - 70^\circ\text{F}}{70 - 10^\circ\text{F}} = 0.8 \quad (\text{Table 2})$$



Heating Curve Table - Dial Set Point

(Warm Weather Shut Down = 70°F)

System Design Temperature, °F

	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230
60	1.0	2.0	3.0													
50	0.5	1.0	1.5	2.0	2.5	3.0	3.5									
40	0.3	0.7	1.0	1.3	1.7	2.0	2.3	2.7	3.0	3.3	3.7					
30	0.3	0.5	0.8	1.0	1.3	1.5	1.8	2.0	2.3	2.5	2.8	3.0	3.3	3.5		
20	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2
10	0.2	0.3	0.5	0.7	0.8	1.0	1.2	1.3	1.5	1.7	1.8	2.0	2.2	2.3	2.5	2.7
0	0.1	0.3	0.4	0.6	0.7	0.9	1.0	1.1	1.3	1.4	1.6	1.7	1.9	2.0	2.1	2.3
-10	0.1	0.3	0.4	0.5	0.6	0.8	0.9	1.0	1.1	1.3	1.4	1.5	1.6	1.8	1.9	2.0
-20	0.1	0.2	0.3	0.4	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.6	1.7	1.8

Outdoor Design Temperature, °F

Table 3

6. Start Up

- **DO NOT START THE PUMP UNTIL THE SYSTEM HAS BEEN FILLED, FLUSHED, PROPERLY VENTED, AND CHECKED FOR LEAKS.**
- Ensure that water does not enter the terminal box during the installation process.
- Do not use the pump to vent the system. Install additional ventilation for system purging.
- Never operate the pump dry. The bearings require water lubrication and will be damaged otherwise.
- Fill system with water. This will result in immediate lubrication of the bearings.
- Operate the pump for 5 minutes, when control installation is complete, to purge remaining air from the bearing chamber. This is especially important when installing the pump during the off-season.

Performance Indicator LEDs (Fig. 11):

- **Power ON:** (Green) indicates power is applied.
- **% of pump performance:** (Yellow) indicates the speed of the pump by flashing at different rates.
- **Call For Heat:** (Green) External device requesting heat from system
- **Pump Perf. Reduced:** (Yellow) Indicates the pump speed is limited due to protection limits.
- **Boiler:** (Green) Boiler activated for operation

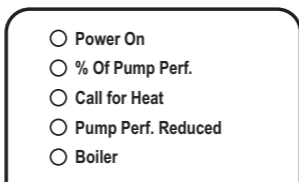


Figure 11 - Performance indicator LEDs

7. Error Messages and Trouble Shooting

Whenever a fault is detected in any of the sensors, the control LEDs will flash in a specific way, to indicate the location of the problem, and the control will assume a specific operating condition.

- Call For Heat LED is flashing (Fig. 12):
 - There is a short or open circuit to OATS Sensor
 - And the control assumes an outdoor temperature of 30°F

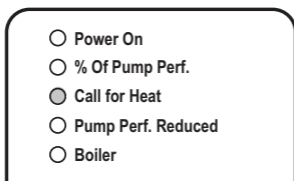


Figure 12 - Control Lights (Call For heat)

- Pump Performance Reduced LED is flashing (Fig. 13):
 - There is a short or open circuit to the Supply Sensor
 - And the control runs pump at 10% and does boiler protection if enabled.

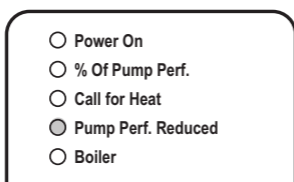


Figure 13 - Control Lights (Pump Performance Reduced)

- Call For Heat and Pump Performance Reduced LEDs are flashing (Fig. 14):
 - There is a short or open circuit to Boiler Return Sensor
 - Boiler protection is disabled

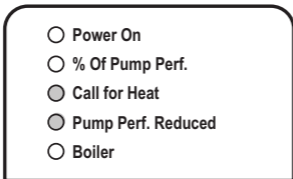


Figure 14 - Control Lights (PPR & CFH)

Testing Sensors:



Warning: No wires connected to control box during testing

Outdoor Air Temperature Sensor (OATS):

- First measure the ambient air temperature next to the OATS sensor.
- Disconnect all field wiring from the OATS sensor.
- Measure (ohms) resistance directly at the OATS sensor location, convert ohms reading to temperature (Table 4).
- Compare ambient air temperature to the measured sensor resistance. Both temperatures should be close +/- 10% (Table 4).

Supply & Return Sensors:

- Disconnect sensor wiring from control box.
- Measure the resistance (ohms) of the Supply then the Return sensor (Wires have no polarity). See Table 4.
- Compare fluid temperature to Resistance/ Temperature Chart (Table 4). Both temperatures should be close +/- 10%.

Possible reasons for short circuit:

- Water in OATS sensor case
- Nail or staple in field wiring

Possible reasons for open circuit:

- Sensor wire jacket has been compromised
- Sensor is disconnected
- Sensor insulation is interfering with sensor at the pipe location
- Faulty sensor

**OATS / Return / Supply
Temperature Resistance Chart**

Table 4

Temperature Resistance			Temperature Resistance		
°F	°C	Ω	°F	°C	Ω
-50	-46	490,813	90	32	46,218
-45	-43	405,710	95	35	7,334
-40	-40	336,606	100	38	5,828
-35	-37	280,279	105	41	5,210
-30	-34	234,196	110	43	4,665
-25	-32	196,358	115	46	4,184
-20	-29	165,180	120	49	3,760
-15	-26	139,402	125	52	3,383
-10	-23	118,018	130	54	3,050
-5	-21	100,221	135	57	2,754
0	-18	85,362	140	60	2,490
5	-15	72,918	145	63	2,255
10	-12	62,465	150	66	2,045
15	-9	53,658	155	68	1,857
20	-7	46,218	160	71	1,689
25	-4	39,913	165	74	1,538
30	-1	34,558	170	77	1,403
35	2	29,996	175	79	1,281
40	4	26,099	180	82	1,172
45	7	22,763	185	85	1,073
50	10	19,900	190	88	983
55	13	17,436	195	91	903
60	16	15,311	200	93	829
65	18	13,474	205	96	763
70	21	11,883	210	99	703
75	24	10,501	215	102	648
80	27	9,299	220	104	598
85	29	8,250	225	107	553

Test the Power Supply or Heat Demand.

Make sure exposed wires and bare terminals are not in contact with other wires or grounded surfaces. Turn on the power or provide a heat demand and measure the voltage across the leads. The voltmeter should read between plus and minus 4 volts of the supplied voltage.

8. MixiMizer Technical Data

Maximum Ambient Temperature:

- 107°F (42°C) with Control Box vertical
- 105°F (41°C) with Control Box on top of pump and horizontal

Outdoor Air Temperature Sensor:

Approvals: CSA, UL
Terminals: Out/V & Com (-)
5V DC +/- 5% Max
0.166 mA DC +/- 5% Max
Operating Range: -67 to 149°F (-55 to 65°C)
Sensor: NTC thermistor, 100ohms @ 77°F
(25°C +/- 0.2°C), B=3892
Enclosure: White U.V. resistant, PVC,
NEMA 1

Control Box:

Input Voltage: 120V +/- 10%, 50/60Hz, 250vA
Output Rating: 1.8A, 1/12Hp

Supply & Return Temperature Sensors:

Approvals: CSA, UL
Terminals: (Sup & Com) (Ret/I & Com)
5V DC +/- 5% Max
0.166 mA DC +/- 5% Max
Operating Range: 14 to 266°F (-10 to 130°C)
Sensor: NTC thermistor, 100ohms @ 77°F
(25°C +/- 0.2°C), B=3892
Wire: 8ft., 300V, UL2722, PVC insulation,
105°C

Optional Boiler On/Off Output:

Terminals: Boil & Boil
30 VAC
2.5 Amp Pilot Duty

Optional Zone Control Input:

Terminals: Dem & Dem
20 - 30 VAC
0.1 VA Max

UP15 Pump:

Max Working Pressure: 145 PSI
Min. Inlet Pressure: 5 PSI
Approvals: UL, cUL listed
Integrated Check Valve: Yes

UP15-42FC/MR:

Connection: GF 15/26 Flange - (2) 1/2"
Diam. Bolt Holes
Flow Range (GPM): 0 - 9
Head Range (ft.): 0 - 14
Motor: 2 Pole, Single Phase
Amps: 0.74
Watts: 85
Hp: 1/25
Max Fluid Temp: 205°F (96°C)
Volute Material: Cast Iron

UP15-42BUCX/MR:

Motor: 2 Pole, Single Phase
Amps: 0.74
Watts: 85
Hp: 1/25
Max Fluid Temp: 205°F (96°C)
Volute Material: Silicon Bronze

BUC5:

Flow Range (GPM): 0 - 8.5
Head Range (ft.): 0 - 14.5
Connection: 1/2" Sweat

BUC7:

Flow Range (GPM): 0 - 16
Head Range (ft.): 0 - 15
Connection: 3/4" Sweat

BE > THINK > INNOVATE >

Limited Warranty

Products manufactured by GRUNDFOS PUMPS CORPORATION (GRUNDFOS) are warranted to the original user only to be free of defects in material and workmanship for a period of 24 months from date of installation, but not more than 30 months from date of manufacture. GRUNDFOS' liability under this warranty shall be limited to repairing or replacing at GRUNDFOS' option, without charge, F.O.B. GRUNDFOS' factory or authorized service station, any product of GRUNDFOS manufacture. GRUNDFOS will not be liable for any costs of removal, installation, transportation, or any other charges which may arise in connection with a warranty claim. Products which are sold but not manufactured by GRUNDFOS are subject to the warranty provided by the manufacturer of said products and not by GRUNDFOS' warranty. GRUNDFOS will not be liable for damage or wear to products caused by abnormal operating conditions, accident, abuse, misuse, unauthorized alteration or repair, or if the product was not installed in accordance with GRUNDFOS' printed installation and operation instructions.

To obtain service under this warranty, the defective product must be returned to the distributor or dealer of GRUNDFOS products from which it was purchased together with proof of purchase and installation date, failure date, and supporting installation data. Unless otherwise provided, the distributor or dealer will contact the GRUNDFOS factory or authorized service station for instructions. Any defective product to be returned to the factory or service station must be sent freight prepaid; documentation supporting the warranty claim and/or a Return Authorization must be included if so instructed.

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